UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/546,392	04/10/2000	Atsushi Watanabe	392.1681/JDH	2369

21171 7590 03/31/2006

STAAS & HALSEY LLP
SUITE 700
1201 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER	
STREGE, JOHN B	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 03/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/546,392	WATANABE ET AL.	
	Examiner	Art Unit	
	John B. Strege	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

The amendment received 1/20/06 has been entered in full.

Response to Arguments

Applicant's arguments filed 1/20/06 have been fully considered but they are not persuasive. Specifically the Applicant argues that Corby, Jr. does not disclose that the reference signals are captured using the same imaging device used to capture image data of the object, or storing the orientation of the robot with respect to the reference object. Examiner respectfully disagrees. As stated in the previous office action it is well known to capture images of an environment in known conditions in order to use them as reference data for orientation purposes later on. Corby discloses the use of manipulator arms typically requires a method of determining the position and orientation of the distal end of the manipulator arm (col. 1 lines 44-46). Corby further discloses moving the manipulator arm to a particular position and videotaping the structure or device which is to be examined (col. 1 lines 56-58). At a later date the manipulator arm is positioned at the same site and current data (such as a video image) is compared to previous data (col. 1 lines 58-60). One of ordinary skill in the art would find the disclosure of Corby enabling. The Applicant further argues that Corby does not disclose that reference images are captured. The Examiner respectfully disagrees, the previous data that is being compared to the current data is read as the reference image, thus this limitation is disclosed.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 33 is rejected under 35 U.S.C. 102(e) as being anticipated by Garibotto et al. USPN 5,911,767 (hereinafter "Garibotto").

Garibotto discloses a robot system (robot navigation system, figure 8) comprising a robot (figure 8); an image capturing device capturing image data of a plurality of objects (image acquisition means, figure 8, col. 7 lines 10-23); a memory storing reference models, each reference model including an image of a reference object captured by the image capturing device in a different direction (means for storing data regarding environment, figure 8, col. 7 lines 10-23); and a processor to perform matching on the image data containing images of the plurality of objects captured by the image capturing device with each of the reference models successively to select one object having an image matched with one of the reference models (computer, figure 8, col. 7 lines 10-23, and col. 7 lines 39-43).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4, 12-15, 23 and 24 are rejected under under 35 U.S.C. 103(a) as being unpatentable over Spight (USPN 4,462,046, previously cited), in view of Corby, Jr. et al. (USPN 5,745,387, hereinafter "Corby").

5. Regarding claim 1, Spight discloses a robot system having an image processing function for determining orientation, or orientation and position of a robot operation on one of a plurality of objects (abstract), the system comprising: a robot 202 (Figure 2); a first image capturing device 40 capturing image data of the plurality of objects containing respective images of the objects (Figure 1; column 3, line 29-38; column 5, line 34-48; column 6, line 11-13); Spight further discloses a memory for string reference images wherein each desired object to be identified would be defined by a plurality of reference signals indicative of a number of particular orientations (capturing direction) of the object being viewed (col. 9 lines 4-19, col. 3 lines 29-38). Spight further discloses a processor 64 to perform matching (correlation) on the image data containing images of the plurality of objects captured by said first image capturing device with each of said reference models successively to select one object having an image matched with one of said reference models (column 7, line 64-column 8, line 15; column 9, line 59-column

10, line 11), and to determine orientation, or orientation and position of the robot operation based on the image of the selected one object, based on said one reference model and the information of its associated capturing direction (column 7, line 28-49; column 8, line 16-37; column 11, line 21-37, it is necessary that the orientation of the robot must be determined based on the orientation of the object in order to drive the robotic effector).

Spight does not explicitly disclose that the reference signals are captured using the same imaging device used to capture image data of the object, or storing the orientation of the robot with respect to the reference object. However it is well known to capture images of an environment in known conditions in order to use them as reference data for orientation purposes later on. Corby discloses that the use of manipulator arms typically requires a method of determining the position and orientation of the distal end of the manipulator arm (and/or subparts) (col. 1 lines 44-46). Corby further discloses moving the manipulator arm to a particular position and videotaping the structure or device which is to be examined (col. 1 lines 56-58). At a later date the manipulator arm is positioned at the same site and current data (such as a video image) is compared to previous data (col. 1 lines 58-60).

Spight and Corby are analogous art because they are from the same field of endeavor of using image processing to manipulate objects in an environment using a robot.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Spight and Corby to obtain the reference images using the same

imaging device . Spight discloses that the images of multiple orientations of the objects are compared with reference objects, and Corby discloses the conventional method of producing reference objects. The motivation for using the same camera to take the reference image and the later images is that it would allow the manipulator arms to determine physical changes in the environment. Thus it would have been obvious to one of ordinary skill in the art to combine Corby and Spight to obtain the invention as specified in claim 1.

Claim 12 is similar to claim 1, thus the same arguments used for claim 1 apply equally to claim 12.

Regarding claims 2 and 13, Spight discloses that said reference models are obtained from a part of the image data of the reference object (column 3, line 29-38; column 6, line 37-52; column 10, line 50-63).

Regarding claims 3 and 14, Spight discloses that said reference models are obtained by processing the image data of the reference object (column 3, line 29-38; column 6, line 37-52; column 10, line 50-63).

Regarding claims 4 and 15, Spight discloses that said first image capturing device 40 comprises a camera for capturing two-dimensional image data (column 5, line 42-48).

Claim 23 is similar to claim 1, thus the same arguments used for claim 1 apply equally to claim 23.

Regarding claim 24, Spight discloses that reference images and reference arrangement information is obtained for workpieces/objects of different shapes (plurality

of configurations of each desired object to be identified), and wherein the finding comprises first determining that a reference image of one of the different shapes matches the working image of the workpiece, and then finding one reference image of the shape that best matches the working image (column 8, line 10-30; column 9, line 4-19).

6. Claims 5 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight, in view of Corby, Jr. et al., and further in view of Suyama et al. (USPN 4,879,664, previously cited, hereafter Suyama) or Stauffer (USPN 4,410,804, previously cited).

Spight nor Corby disclose that the image data are captured from a predetermined distance. Suyama discloses a three-dimensional position sensor comprising robot-teaching apparatus wherein said image data of the reference object are captured by said camera (Figure 11a, element 35) from a predetermined distance (column 6, line 20-37). In addition, Stauffer teaches that if a two-dimensional sensor is used, the image processor is unable to simultaneously determine the distance to the object unless the objects are always positioned at a known distance (column 1, line 31-39). It would have been obvious to one of ordinary skill in the art at the time the invention was made to capture an image at a predetermined distance in order to adjust the position and posture of teaching head 3 with respect to the workpiece 9 as taught by Suyama (column 6, line 20-37) or such that the distance to the object need not be determined by other means as taught by Stauffer (column 1, line 31-39).

7. Claims 6, 7, 11, 17, 18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight, in view of Corby, Jr. et al., and further in view of Maeno et al. (USPN 5,047,714, previously cited, hereafter Maeno).

Regarding claims 6 and 17, Spight nor Corby disclose that the robot moves a second image capture device to have the determined orientation and/or position. Maeno discloses a method of recognizing surface-mounted parts including a robot system comprising a second image capturing device (Figure 7c, element 10); wherein said robot situates said second image data capturing device to have said determined orientation or to have said determined orientation and said determined position with respect to the selected one object (column 4, line 44-49), and a processor processes second image data captured by said second image capturing device to detect position and/or rotational posture of the selected one object with respect to said second image data capturing device (column 4, line 54-63). It would have been obvious to one of ordinary skill in the art at the time the invention was made to move the second image capture device (imaging tube) to have the determined orientation and/or position as taught by Maeno in order to locate position detecting patterns located at specific positions to accurately and directly determine the position and direction of conductor patterns on the printed circuit board (column 1, line 51-59).

Regarding claims 7 and 18, Spight nor Corby disclose that the robot moves a second image capture device to have the determined orientation and/or position. Maeno discloses a robot system comprising a second image capturing device for obtaining three-dimensional position; wherein said robot situates said second image

data capturing device to have said determined orientation or to have said determined orientation and said determined position with respect to the selected one object, so that the second image data capturing device is directed to a characterizing portion of the object; and wherein said processor detects the three-dimensional position and/or posture of the selected one object based on the position of said characterizing portion obtained by said second image data capturing device (see discussion of claims 6 and 17 above). Maeno does not explicitly disclose that the three-dimensional position of the selected one object, but the examiner takes Official Notice that obtaining three-dimensional position of an object is well known in the art. It would have been obvious to one of ordinary skill in the art at the time the invention was made to detect the three-dimensional position of the object in order to determine the location of the object in space so that operations may be carried out upon it.

Regarding claims 11 and 22, Spight discloses that said robot operation is an operation of picking up the selected one object from the plurality of objects, some of which are overlapped (randomly arranged) with each other (column 6, line 11-13).

8. Claims 8, 19, 27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight, in view of Corby, Jr. et al., in view of Maeno and further in view of Soderberg (USPN 4,785,528, previously cited).

Regarding claims 8, 19, 27, and 30, Maeno does not disclose that said first image data capturing device is used as said second image data capturing device. Soderberg discloses a robotic work positioning system including a camera 34 mounted

on member 28 of robot 10 which serves as both the first and second image data capturing device since it both determines the position of the work, and is moved to have the determined orientation and/or position (Figure 1; column 2, line 53-column 3, line 1, line 44-50; column 5, line 34-41). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use said first image data capturing device as said second image data capturing device as taught by Soderberg in order to retrieve parts from a conveyor using a vision system to select the desired part from other parts and engage the part at precisely the correct location to be properly placed by the robot (column 5, line 60-column 6, line 6).

9. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight, in view of Corby, Jr. et al., and further in view of Soderberg.

Regarding claim 25, Spight nor Corby disclose that the robot is used to capture the reference images. Soderberg discloses a robot that is used to capture reference images, and wherein the reference arrangement information represents arrangements of the robot when capturing the reference images (Figure 1; column 2, line 53-column 3, line 4, line 31-59; column 5, line 60-column 6, line 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a robot to capture reference images as taught by Soderberg in order to retrieve parts from a conveyor using a vision system to select the desired part from other parts and engage the part at precisely the correct location to be properly placed by the robot (column 5, line 60-column 6, line 6).

Regarding claim 26, Spight nor Corby disclose that a second imaging device is affixed to the robot. Soderberg discloses a camera 34 mounted on member 28 of robot 10 and is used to determine additional arrangement information used to determine the known arrangement of the robot relative to the workpiece (Figure 1; column 3, line 44-50; column 5, line 34-41). It would have been obvious to one of ordinary skill in the art at the time the invention was made to affix an imaging device to the arm of a robot as taught by Soderberg in order to retrieve parts from a conveyor using a vision system to select the desired part from other parts and engage the part at precisely the correct location to be properly placed by the robot (column 5, line 60-column 6, line 6).

10. Claims 9, 10, 20, 21, 28, 29, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spight, in view of Corby, Jr. et al., in view of Maeno, and further in view of Sakakibara et al. (JP 07-270137, previously cited, hereafter Sakakibara).

Regarding claims 9, 20, 28, and 31, Maeno does not disclose that said second image capturing device comprises a three dimensional visual sensor of spot-light scanning type. Sakakibara discloses a three dimensional visual sensor usable in robot automation (page 1, paragraph 1), of spot-light scanning type capable of measuring distance between the sensor and an object (page 3, paragraph 15). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a three dimensional visual sensor of spot-light scanning type as taught by Sakakibara in

order to quickly and accurately determine the three dimensional position of an object using one device (page 2, paragraph 11).

Regarding claims 10, 21, 29, and 32, Sakakibara discloses an image data capturing device comprising a structured-light unit for irradiating a structured light on the selected object and capturing an image of the object including the irradiated light on the object (page 3, paragraph 16).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Strege whose telephone number is (571) 272-

7457. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600